MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The REVIEW for September, 1894, is based on reports from 3,475 stations occupied by regular and voluntary observers. These reports are classified as follows: 149 reports from Weather Bureau stations; 41 reports from U. S. Army post surgeons; 2,506 monthly reports from State Weather Service and voluntary observers; 32 reports from Canadian stations; 223 reports through the Southern Pacific Railway Company; 476 marine reports through the co-operation of the Hydrographic Office, Navy Department, and "New York Herald Weather Service;" monthly reports from 40 U. S. Life-Saving stations; 8 reports from navigators on the Great Lakes; monthly reports from local services established in all States and Territories; and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

The WEATHER REVIEW for this month has been prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the editor, but the statistical tables are furnished by the Division of Records and Meteorological Data, in charge of Mr. A. J. Henry, acting chief of that division.

CHARACTERISTICS OF THE WEATHER FOR SEPTEMBER, 1894.

The most prominent features of the month of September were the hurricane which entered the Windward Islands on the 20th, passed over Cuba on the 24th, and was moving northeastward south of Cape Cod on the 30th; the dry and hot weather which generally prevailed over the United States, but which was gradually brought to an end by a series of local rains; the remarkable series of local tornadoes that prevailed on the 21st in the Northwest, and which have been made the subject of a special discussion by Prof. H. A. Hazen.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers not reduced to standard gravity and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), during September, 1894, is shown by isobars on Chart II. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border. This Chart also gives the so-called resultant wind directions for this month, based on the data given in Table IX of this REVIEW.

During the current month of September pressures have been highest, 30.14 at St. Vincent, 30.13 at Halifax, Yarmouth, and Block Island, and 30.11 at Key West; lowest, 29.86 at St. Vincent, and still lower to the northward. The low area of the Gulf of California is shown by the averages, 29.85, at Tucson and, 29.79, at Yuma.

The normal distribution of atmospheric pressure and normal resultant wind direction for the month of September were approximately shown on Chart V of the REVIEW for September, 1893, as computed by Prof. H. A. Hazen, and are not now reproduced. As compared with the normal for September, the mean pressure for the current month was above the normal in New England and Nova Scotia, but below the normal in the Lake region, Northwest, Manitoba, and Saskatchewan. The maximum deficit was 0.11, at Pierre, S. Dak.

As compared with the preceding month of August, the pressures, reduced to sea level, show a maximum fall of 0.14 at St. Vincent and 0.11 at Key West, and a maximum rise of 0.14 at Eastport.

DIURNAL VARIATIONS.

The systematic periodic diurnal variations of pressure are shown by the hourly means given in Table VI.

AREAS OF HIGH AND LOW PRESSURE.

The following sections give some details as to the phenomena attending the individual areas of high and low pressure. The storm warnings officially issued by the Weather Bureau either through the general forecast official at Washington, or by the respective local forecast officials, are enumerated in connection with the respective areas of disturbance.

MOVEMENTS OF CENTERS.

The following table shows the date and location of the center at the beginning and ending of each area of high or low pressure that has appeared on the U. S. Weather Maps during the month, together with the average daily and hourly velocities. The monthly averages will differ according as we consider each path as a distinct unit, or give equal weight

to each day of observation; in the first case the monthly average is taken by paths, in the latter case by days.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, a. m.	34	73	3, a. m.	37	76	500	2.0	250	10.0
II	1, a. m.	43	126	8, a. m.	46	65	4,300	7.0	614	26.0
III	1, p. m.	55	89	5, a. m.	38	74	1,850	4.0	463	19.0
IV	5, p. m.	45	129	17, a. m.	44	59	4,600	12.5	368	15.0
V	8, p. m.	30	84	10, a. m.	31	85	700	1.5	467	20.0
VI	12, a. m.	42	126	16, a. m.	43	85	2,800	4.0	700	29.0
VII	15, p. m.	48	125	18, p. m.	48	79	2,400	3.0	800	33.0
VIII	17, p. m.	43	129	21, a. m.	40	114	1,600	3.5	457	19.0
IX	20, a. m.	48	100							
X	20, a. m.	35	89	22, a. m.	37	71	1,150	2.0	575	26.0
XI	21, p. m.	46	129	30, p. m.	49	57	5,800	9.0	644	27.0
XII	23, a. m.	33	81	23, p. m.	32	78	200	0.5		
XIII	25, p. m.	37	125	28, p. m.	41	123	600	3.0	200	8.0
XIV	28, a. m.	54	105	30, p. m.	39	91	1,500	2.5	600	25.0
Sums							27,600	54.5	6,124	
Mean of 12 paths									510	21.2
Mean of 54.5 days									506	21.1
Low areas.										
I										
II	1, a. m.	49	101	1, p. m.	48	96	150	0.5		
III	1, a. m.	47	57							
IV	2, a. m.	49	67							
V	2, a. m.	54	115	8, p. m.	42	89	1,750	6.5	269	11.0
Va	2, p. m.	53	108	3, a. m.	48	99	750	0.5		
Vb	3, p. m.	54	107	4, a. m.	55	104	200	0.5		
VI	4, p. m.	46	76	5, p. m.	49	56	1,000	1.0	1,000	42.0
VII	5, a. m.	27	88	6, p. m.	32	87	300	1.5	200	8.0
VIII	7, p. m.	55	113	11, a. m.	46	58	2,750	3.5	786	33.0
IX	10, p. m.	53	115	16, p. m.	52	88	2,300	6.0	383	10.0
IXa	13, p. m.	41	101							
IXb	13, p. m.	43	98							
X	16, p. m.	57	121	19, a. m.	52	96	1,300	2.5	520	22.0
XI	16, a. m.	26	94	21, a. m.	48	65	2,500	5.0	500	21.0
XII	20, a. m.	15	59	30, p. m.	39	70	2,900	10.5	276	12.0
XIII	20, p. m.	58	115	24, a. m.	56	60	2,200	3.5	687	29.0
XIV	22, a. m.	35?	130?	30, p. m.	51	77	3,300	8.5	389	16.0
XIVa	25, p. m.	47	103	26, a. m.	52	95	500	0.5		
XV	28, a. m.	45?	130	30, p. m.	51	119	850	2.5	340	14.0
Sums							22,750	53.0	5,350	
Mean of 11 paths									486	20.0
Mean of 53 days									429	17.9

HIGH AREAS.

I.—On the 1st, a. m., pressure was highest on the Atlantic coast and so continued, gradually disappearing by the 3d, a. m.

II.—The map of the 1st, a. m., shows a slight high pressure advancing eastward toward the California coast. The central pressure was, by the 3d, a. m., in Oregon. During the 5th this merged into a general high pressure, reaching entirely across the continent, whose center on the 8th, a. m., was located in New Brunswick.

III.—This high pressure descended southeastward, between the 1st and the 5th, from the region north of Manitoba, and disappeared on the mid-Atlantic coast.

IV.—The map of the 5th, p. m., shows a high pressure pushing eastward toward Oregon. This became a very extensive area, covering the Rocky Mountain plateau and eastern slope on the 10th and reaching the Atlantic Ocean by the 12th; it then merged into the Atlantic high pressure and had entirely disappeared by the 17th.

V.—This was a small elevation pushing in from the Atlantic and West Indian regions northwestward over the south Atlantic States; it prevailed during the 8th, 9th, and 10th.

VII.—On the 12th, a. m., high pressure again advanced from the Pacific toward Oregon, and by the 14th, a. m., was central in the Rocky Mountain plateau region, and by the 15th, a. m., stretched entirely across the continent from east to west. On the 16th this high pressure prevailed over the entire United States, but low pressures appeared on its northern edge near Lake Superior and on its southern edge over the Gulf of Mexico, after which this area was immediately succeeded by No. VII.

VII.—The map of the 15th, p. m., shows two regions of highest pressure in the general area of high pressure, of which the extreme western one over Oregon is called No. VII. The general area of high pressure, called the tropical area, which appears comparatively smooth and regular on the maps of monthly mean pressure is, in reality, the result of many ridges and areas of high pressure that appear on the daily maps under very diverse forms. The maps of the 15th and 16th present a temporary and almost complete agreement with the ideal suggested by the monthly maps, as we have here a broad belt of high pressure extending from beyond the Bermudas on the east to beyond the coast of Oregon on the west, presenting a belt stretching 5,000 miles east and west with the equatorial low pressure on its south side and the Arctic low pressure on the north. This is a partial realization of the mechanical problems treated of by Helmholtz in his first paper on atmospheric motion. The instability of this formation is due not so much to vertical or horizontal irregularities in the distribution of atmospheric density as to the resistances offered by the oceans, the continents, and the mountains to the motions of the atmosphere. These irregularities in the horizontal distribution of the coefficients of resistance allied to friction, but not properly so called, very soon break up the tropical high pressure into smaller areas moving about and feeding cyclonic centers. The areas Nos. VI and VII lost their continuity on the 15th, and during the 16th a number of well-marked low areas were in a state of rapid development, reproducing in the atmosphere the phenomena of uprushes and descending whirls that are seen in the turbulent motion of any river. By the 18th, a. m., area No. VII had become a long ridge, stretching from Kansas to James Bay, separating well-marked low areas in the Gulf of Mexico and Saskatchewan.

VIII.—On the 17th and 18th a ridge of high pressure extended from Oregon southeastward, and on the 20th it stretched from Oregon to Texas, after which it rapidly contracted and disappeared; the highest pressure was always on the Pacific coast.

IX.—This is a small area of high pressure that is shown on the map of the 20th, a. m., and does not appear afterwards. It is interesting only as representing the slight barometric elevation in the midst of several depressions which have received their numbers as low areas, and it may have contributed to bring about the condition favorable to the formation of the tornadoes that occurred on the 21st.

X.—This area also appeared on the 20th, a. m., as a slight elevation in the Gulf States, moved slowly eastward, and disappeared off the Atlantic coast on the 22d.

XI.—On the 21st an area of high pressure moved northeastward throughout British Columbia, while low pressure No. XIII was undoubtedly still further north. In general, the high areas that pursue this northeast course toward Oregon and British Columbia attend low areas to the northward. This high pressure soon rapidly degenerated into a narrow ridge parallel to the Rocky Mountain plateau, but on passing eastward it became an extensive area of high pressure that was central in South Dakota on the 24th, a. m., while the hurricane, low No. XII, was passing northward between Habana and Matanzas. This high pressure moved eastward to the north of the hurricane center until the 27th, p. m., when it was central in Nova Scotia; after this the center seems to have had a westward movement, owing to an inflow of more air from Labrador, and it disappeared on the 30th, p. m., in Newfoundland.

XII.—This area of high pressure represented the westward

movement of the Atlantic high pressure, and. to a certain extent, may have been the result of the circulation of air around the West Indian hurricane. Pressure was high on the 23d, a. m., in South Carolina and on the 23d, p. m., off the South Carolina coast.

XIII.—On the 25th and 26th pressure rose on the California coast, while low pressures prevailed in Dakota and Florida; by the 27th, p. m., pressure had risen in Oregon; it was highest on the 28th, a. m., in northern California, after which this high pressure disappeared.

XIV.—On the 28th, a. m., pressure was rising rapidly in Alberta, Saskatchewan, Assiniboia, and Manitoba, while low pressures existed on the coast of British Columbia and in the lower Missouri Valley. This high pressure stretched rapidly southward from Manitoba to Mexico, and on the 30th, a. m., was central in Kansas, with killing frosts throughout that and neighboring States.

LOW AREAS.

It is believed that all depressions marked as "Low" on the Daily Weather Map have been included in the following list:

I.—This number is given to the area of low pressure stretching from the Gulf of California northward. Four epochs of lowest pressure at Yuma occurred during September, namely, on the 6th, 12th, 19th, and 27th. On the 12th Yuma was at the southern end of the trough of low pressure which extended far north of Saskatchewan and was central in Manitoba. On the other dates Yuma was at the center or north of the center of lowest pressure. On the 19th to 22d the low pressure extended westward over the Pacific, and apparently accompanied a storm center moving northeastward (*see* low area No. XIV). The regularity of the interval between the passage of successive troughs eastward over the Rocky Mountain region shows that we have here to do with a series of waves in the upper atmosphere and a corresponding series of surges in the lower atmosphere, as well as with the disturbances caused by moisture and heat at the earth's surface.

II.—This was central on the morning of the 1st in Manitoba, and was a continuation, or a branch, of low area No. XVII of the August series. After the 1st, p. m., it disappeared north of Minnesota, while the principal depression apparently continued central in Alberta.

III.—This was central on the 1st, a. m., near southern Newfoundland, and was a continuation of low No. XVI of the August series.

IV.—This was central near Anticosti on the 2d, a. m., and was apparently an eastern extension of the large area that included No. II in its western portion and No. III in its eastern portion.

V, V*a*, and V*b*.—This was central on the 2d, a. m., in northern Alberta, and was evidently the southwestern portion of the general low pressure to the northward. After moving southeastward during the 3d, and sending a branch (V*a*) into Saskatchewan and another branch (V*b*) southeastward on the 4th into Manitoba, it finally filled up on its northern side, and the main depression moved southeastward along the Rocky Mountain region, disappearing in northern Illinois on the 8th.

In connection with low area No. V, the following signals were ordered: Washington, 8th, 10.55 a. m., information signals from Delaware Breakwater to Woods Holl (except New Haven and New London).

In connection with low area No. V*a*, the following signals were ordered: Washington, 3d, 10.30 a. m., information signals on lakes Superior, Michigan, Huron, and Pepin.

VI.—This was central north of Ottawa on the 4th, p. m., being apparently a southern branch from a large area lying to the northward. On the 5th, a. m., it was near the mouth of the St. Lawrence, and on the 5th, p. m., over Newfoundland.

VII.—This was apparently a small whirl moving northward into the eastern portion of the Gulf of Mexico during the 5th and 6th. Its track, as given on Chart I, is quite uncertain.

In connection with this low area, the following signals were ordered: Washington, 5th, 10.00 p. m., information signal at Pensacola. 6th, 9.00 a. m., southwest storm, Pensacola; 3.00 p. m., northwest storm, Pensacola.

VIII.—This appeared on the 7th, p. m., in Athabasca, and moved southeastward along the northern limit of the Weather Map, reaching the Ottawa River on the 10th, a. m., and disappearing southward of Newfoundland on the 11th, a. m.

In connection with low area No VIII, the following signals were ordered: Washington, 10th, 9.35 a. m., information signal at Buffalo; 9.48 a. m., southwest storm signals, New York and Sandy Hook to Portland; 10 a. m., northwest storm signals at all stations on lakes Superior, Michigan, and Huron (except Duluth and Ashland sections), and information signals in Duluth and Ashland sections; 10.35 a. m., northwest storm signals at Detroit, Toledo, Sandusky, and Cleveland.

IX.—This appeared in British Columbia on the 10th, p. m., and, after descending southward along the Rocky Mountain region and forming two subordinate low areas, IX*a* and IX*b*, it disappeared north of the Lake region on the 16th.

In connection with this low area, the following signals were ordered: Washington, 12th, 10.10 a. m., information signals on Lake Pepin, at Duluth and Ashland section; 8.30 p. m., southeast storm signals on lakes Pepin. Superior, Michigan, and Huron; 10.10 p. m., information signals at Detroit, Toledo, Sandusky, and Cleveland. 13th, 9.55 a. m., storm signals changed to information signals on lakes Superior, Michigan, Huron, and Pepin. 15th, 10 a. m., information signals on lakes Huron and Michigan and at Marquette and Sault Ste. Marie; 4 p. m., information signals changed to northeast storm at Marquette, Sault Ste. Marie, and on Lake Huron. 16th, 11.30 a. m., information signals at Duluth, Ashland section, Houghton section, Green Bay and section, Mackinaw section, and Alpena; southeast storm signals at Marquette and Sault Ste. Marie.

X.—This depression appeared on the 16th in the northern portion of British Columbia. It moved slowly southeastward into Assiniboia, and disappeared on the 19th between Manitoba and James Bay.

XI.—This was an indefinite depression in the Gulf of Mexico during the 16th and 17th, but accompanied by heavy rain and high wind on the coast, indicating the presence of a small cyclone in the Gulf. It moved northeastward through the Atlantic States on the 18th, 19th, and 20th, and disappeared on the 21st at the mouth of the St. Lawrence River.

In connection with this low area the following signals were ordered: Washington, 17th, 10.30 p. m., information signals at Port Eads, New Orleans to Punta Gorda; 10.50 p. m., information signal at Key West. 18th, 9.47 p. m., information signals from Jacksonville to Atlantic City, except Baltimore. 19th, 9.40 a. m., southwest storm signals at Norfolk and section, West Point, and Newport News; 9.40 a. m., northeast storm signals from Delaware Breakwater and Baltimore to Woods Holl section; 10.30 a. m., northeast storm signals at Port Huron and Saginaw Bay section; 10.45 p. m., northeast storm signals at Boston and section, Portland, and Eastport.

XII.—This was a tropical hurricane which passed westward between Dominica and Guadeloupe. What little is known of its earlier history is given in the chapter on "North Atlantic Storms." The center passed over the southern portion of San Domingo and Haiti and along the southern coast of Cuba, finally crossing that island and emerging between Habana and Matanzas on the morning of the 24th; it passed northward between Key West and Tortugas, a little east of Titusville, on the 26th, a. m., between Savannah and Charles-

ton on the 27th, a. m., near Morehead City, N. C., on the 28th, a. m., and had, by the 30th, p. m., reached a position approximately N. 39°, W. 70°. A full account of this storm is given in "Special Storm Bulletin No. 2 of 1894," showing that its path was fully announced and predicted by the official dispatches and warnings of the Weather Bureau.

In connection with this hurricane the following signals were ordered: Washington, 23d, 11.20 a. m., northeast storm signal at Key West; 11.20 a. m., information signals from Punta Gorda to Galveston; 9.40 p. m., northeast storm signals at Cedar Keys, Punta Gorda, Jupiter, and Tampa; 9.40 p. m., information signals from Jacksonville to Charleston. 24th, 9.48 a. m., northeast storm signals at Port Eads, Mobile, Pensacola, Jacksonville and section; 12.15 p. m., information signals from Wilmington to Newport News; 12.15 p. m., northeast storm signals at New Orleans, Savannah and section, and Charleston; 10.30 p. m., information signals at Galveston; 10.50 p. m., northeast storm signals at Wilmington and section. 25th, 7.30 a. m., northeast storm signals changed to southwest at Key West; 9.55 a. m., northeast storm signals at Morehead City, Washington, Norfolk and section, Newport News, and West Point; 2.00 p. m., northeast storm signals at Mobile, Pensacola, New Orleans, and Port Eads; 3.48 p. m., information signals from Baltimore to New York; 9.45 p. m., southeast storm signal at Jupiter; 9.45 p. m., southwest storm signal at Punta Gorda. 26th, 9.10 a. m., northeast storm signals from Delaware Breakwater to Boston; 9.10 a. m., northeast storm signal at Baltimore; 2.40 p. m., northeast storm signals changed to northwest at Jacksonville and section; 2.40 p. m., northeast storm signals changed to northwest from Savannah to Charleston. 27th, 9.30 a. m., southeast storm signals at Morehead City, Washington, Norfolk and section, Newport News, and West Point; 9.43 a. m., northeast storm signals changed to southeast at Wilmington and section. 28th, 8.00 a. m., northwest storm signal changed to information at Charleston. 29th, 10.10 p. m., northeast storm signals at Atlantic City, Sandy Hook, New York, and Narragansett section.

The reports from Tampa show that the hurricane center passed northward some distance to the east of Tampa, where the maximum wind during any five minutes was 43 miles per hour, with one minute puffs of 60 miles. The lowest barometer was 29.48, at 8 p. m., of the 25th. The observer, Mr. Considine, states that this hurricane center passed nearer to that station than any other hurricane since 1846. The rainfall during fifty-four hours, ending at 8 a. m. of the 26th, was 13.78 inches.

At Titusville the rainfall during forty-eight hours, while under the influence of the passing storm, was 7.72 inches; the range of temperature during the 25th and 26th was but 1.5°. A wind of from 48 to 60 miles an hour from the northeast began about 8 a. m., of the 25th, and continued until midnight.

At Jacksonville the northeast gale, beginning at midnight, reached a maximum of 48 miles at 10.40 a. m. of the 26th; the total rainfall during the storm was 11.11 inches.

On the 30th, while the storm center was south of Rhode Island and east of New Jersey, the northeast gale that prevailed all day at Narragansett Pier, with high tide and very heavy surf, was considered to be the most severe of the season at that place as well as along the entire coast of Long Island to the west and of New England and Nova Scotia to the east. At St. Johns, N. F., a heavy gale was also prevailing at that time, but this belonged to the storm *M* of the Atlantic series and not to this present hurricane center, although the newspaper paragraphs frequently confuse these storms.

Mr. Boyer, Weather Bureau Observer at Key West, reports as follows:

September 22, thunderstorm from 5.20 to 5.50 p. m. The storm moved from northeast toward southwest. The squally character of the rain during the thunderstorm was the first symptom indicative of cyclonic influence. This squally tendency, peculiar to tropical storms, can not be mistaken by those who have experienced and noted them. 23d, day opened partly cloudy, cirrus clouds moving from the south; wind increasing from fresh to brisk and becoming squally. Toward midday the cirrus clouds thickened, producing solar halo; northeast storm signal hoisted at 12.30. During the afternoon lower clouds thickened, wind increased to high northeast squalls of wind and rain from 4.45 to 5.45 p. m.; at 10 p. m., wind northeast 44 miles, with rain squalls; barometer slowly falling. 24th, barometer falling more rapidly, with high northeast wind, until 1.45 a. m.; at 7.50 a. m., heavy squall of 48 miles per hour.

From this time on the hourly observations were as follows: 8 a. m., 29.80, NE., 42 miles, light rain; 9 a. m., 29.80, NE., 43, light rain squall; 10 a. m., 29.78, NE., 48, light rain squalls, scud from east-northeast; 11 a. m., 29.77, NE., 42, light rain squalls; noon, 29.74, NE., 40, heavy rain squalls; 1 p. m., 29.70, NE., 40, heavy rain; 2 p. m., 29.66, E., 37, light rain squalls; 3 p. m., 29.60, NE., 52, heavy rain; the violent wind began at 2.27; 4 p. m., 29.56, NE., 44, heavy rain; 5 p. m., 29.48, NE., 58, heavy rain; 6 p. m., 29.46, NE., 56, violent squalls of 72 miles; 7 p. m., 29.43, NE., 42, squalls of 60 miles; 8 p. m., 29.38, NE., 33, light rain; 9 p. m., 29.35, E., 33, less violent squalls; 10 p. m., 29.32, SE., 13, light; 11 p. m., 29.31, ESE., 20, light rain; midnight, 29.27, E., 20, light rain; thunder, with sharp lightning, began at midnight.

25th, 1 a. m., 29.25, E., 18, scud from ESE., thunder ceased at 12.40; 2 a. m., 29.20, SE., 9, light rain; 3 a. m., 29.18, SE., 10; 4 a. m., 29.16, SSE., 16; 5 a. m., 29.13, S., 24; 6 a. m., 29.10, SSW, 30, wind suddenly increased to 38 miles at 5.40; 7 a. m., 29.13, SW., 24, NE. signals changed to SW., cirro-stratus moving from WNW.; 8 a. m., 29.13, SW., 28. The rainfall was 5.85 inches from noon of the 24th to this present 8 a. m.; 9 a. m., 29.11, SW., 50, squalls of great violence, impossible to go on the roof, barometer pumping violently; 10 a. m., 29.19, SW., 40, violent squalls; between 8.30 and 9.30 a. m., there were violent and sudden fluctuations of about 0.1 of an inch in the barometer; 11 a. m., 29.20, SW., 70; violent gusts and heavy rains; the maximum velocity of the hurricane occurred at 11.20 a. m., with a terrific squall recording 87 miles in five minutes and an extreme of 104 miles per hour during one minute; noon, 29.28, SW., 42, heavy rain; 1 p. m., 29.35, SW., 60, violent gusts and heavy rains; 2 p. m., 29.38, WSW., 44; 3 p. m., 29.41, W., 43; 5 p. m., 29.48, W., 38; 6.30 p. m., 29.51, W., 36; 8 p. m., 29.56, W. 30.

On the morning of the 26th the winds and clouds were moving from the west, with occasional wind and rain squalls. During the day a permanent bank of stratus and cumulo-stratus remained visible in the northwest; the rainfall from 8 a. m. of the 25th to 8 a. m. of the 26th was 1.91 inch. The gulf water did not back up with the southwest winds and flood the city as was the case in the hurricane of October 19, 1876. The barograph curve of the 25th shows three minima similar to those at Mauritius, April 29, 1892, but not so well defined as those. The three readings were: 6 a. m., 29.10; 9 a. m., 29.11; 11.30 a. m., 29.15. A study of the wind velocities will show that each of these readings was recorded immediately after a strong squall when the wind was on the lull. At 5 a. m. of the 25th the wind was S., 24; at 5.40 it had increased to 38, after which it began to moderate; the first minimum reading was registered at 6 a. m., and by 7.15 a. m. the wind had subsided to 18; at 7.45 p. m. the wind changed to southwest, increasing in force. The second minimum, 29.11, occurred at 9 a. m., immediately after a violent squall of 65 miles, at 8.50 a. m.; by 9.05 a. m. the velocity had fallen to 43. The third minimum, 29.15, occurred at 11.30 a. m., immediately after the terrific gust of 104 miles at 11.20 a. m. The very marked lull in the wind force from 9 p. m. of the 24th to 5 a. m. of the 25th indicates the very close proximity of the vortex. The hypothesis that special depressions of very limited extent were developed at or near the vortex seems the most tenable one, as heavy squalls or gusts are thus produced to fill up the depression. The leaves of trees and plants were much affected by the hurricane winds, particularly on the southwest side, as if scorched by fire.

Mr. E. R. Demain, Weather Bureau Observer, Jacksonville, Fla., October 12, 1894, writes as follows:

Captain Moorhouse, of the three-masted British schooner *Coniston*, reports as follows: I left Tortugas (Keys) on the morning of the 22d, that was Saturday. Sunday morning I saw the barometer was going down. The first heavy squall struck me at 3 o'clock, 23d, from about east-northeast. It kept blowing worse and the wind continued east-northeast till 4 o'clock Monday afternoon (24th). I noticed about 4 o'clock that the wind suddenly went to east by south. Though I was on the east of the center, I steered west and so ran till 11 o'clock, when I struck the calm in the center of the storm. The storm was moving very slowly, about 10 miles an hour. At 2 a. m. Tuesday (25th) the wind was very heavy from west-southwest and continued so till 5 p. m. Tuesday, when the weather was clearing.

I must have been a little west of Key West. I judge I ran 50 miles back before I struck the calm; must have been somewhere west of Tortugas. Judge the storm was traveling north-northwest when it passed me. Never saw such rain; it was something terrible and continued till after the storm broke up; had very heavy rain squalls till after 12 at night. On the commencement of the storm we had a little lightning, but no thunder. I never heard any thunder in the five hurricanes which I have experienced. It was

the heaviest storm I was ever in. I think that the wind blew fully 120 miles per hour.

Mr. Fred. W. Ramsden, of the British Consulate, Santiago de Cuba, October 15, 1894, writes as follows:

From telegrams I received from the Windward Islands and from San Domingo and Haiti, and from my own observations here, I have reason to believe that the track of the center was as follows: It passed between the islands of Dominica and Guadeloupe about 1 p. m. on the 20th of September; was 150 miles southwest of San Juan de Puerto at 7 a. m. of the 21st; passed almost over and just to the south of the city of San Domingo about 2 a. m. on the 22d; then a little to the north of Port au Prince about midday of the 22d, and south of St. Nicolas Mole the same afternoon, reaching the city of Santiago de Cuba at half past 12 a. m. of the 23d. (Here we had very strong north and north-northwest winds up to that hour, when it became almost calm, veering to the northeast and east, commencing suddenly again to blow violently at 8 a. m. from the southeast.) After passing here its course was just south of Cienfuegos, having begun to slow down for curving at midday of the 23d before reaching that meridian, and, I believe, it then passed up between Habana and Matanzas on the 24th, and thence to Key West, etc.

Mr. Rafael Junquera, Weather Bureau Observer at Santiago de Cuba, writes as follows, November 14, 1894:

September 20, about 1 p. m., the center passed between Dominica and Guadeloupe; at 7 a. m. of the 21st it was southwest of Puerto Rico; on the 22d, at 2 a. m., it entered the mainland at San Domingo to the south of the capital, ransacking this country and Haiti; it passed south of St. Nicolas Mole on the afternoon of the 22d, and the center of the storm area reached Santiago by 12.30 a. m. of the 23d. The storm track became very irregular as soon as it reached the mainland of San Domingo and Haiti, and I believe that the mountains of San Domingo and Haiti changed its course to the south.

The cloud movements in the vicinity of this station showed perfectly well that the storm track would travel to the south of this station. I consider that the northern border of the storm vortex passed very near to this city and that the section of the vortical calms passed to the north of Cape Cruz.

At Merida, Yucatan, Signor Felix Gomez made the following record, which is translated by Mr. Symons from the monthly bulletin for September, 1894, published by the Central Magnetic-Meteorologic Observatory of Mexico, to which institution Mr. Gomez sent a storm warning by telegraph:

On Saturday, September 22, at 4.40 p. m., we observed in the northeast many scattered clouds of a cumulo-nimbus type coming rapidly at a low altitude. This was the first indication which led me to surmise that a storm existed in the southeast, and I immediately began to watch the wind and the barometer; the wind was east-northeast, and the mean pressure for the day was 29.93 inches.

On Sunday, 23d, the sky was occasionally overcast; there were light northerly squalls; the vane pointed steadily to east-northeast until the afternoon, when it went to north-northeast, and the pressure fell to 29.92 inches.

On Monday, 24th, the sky continued overcast at intervals; there were light squalls; the vane kept north-northeast until the afternoon, when it went to north-northwest, and the pressure fell to 29.87 inches.

On Tuesday, 25th, the wind was variable between northwest and west-northwest, and the sky clear; the barometer fell to 29.84 inches, and in the afternoon the wind backed to west-southwest.

On Wednesday, 26th, the wind went round to southwest and the barometer rose to 29.86 inches, and a drizzle gave 0.05 inch of rain.

Though the indications of the barometer were very slight, the aspect of the sky and the backing of the wind showed that Merida was on the western skirt of a cyclone, therefore we reported to the observatory on the 23d and subsequent days that a depression existed to our east.

XIII.—This began on the 20th, p. m., in British Columbia and disappeared on the 24th in Labrador. In the first part of its course it moved rapidly southward into Iowa, and on the 22d it described a retrograde movement on Lake Superior.

In connection with this low area the following signals were ordered: Washington, 22d, 10.02 a. m., information signals on Lake Michigan and in Houghton section; 10.02 a. m., southwest storm signals at Marquette, Sault Ste. Marie, and Lake Huron; 10.20 a. m., information signal at Buffalo; 11.30 a. m., southwest storm signals on Lake Erie; 3.00 p. m., changed from information signals to southwest storm on Lake Michigan; 10.20 p. m., southeast storm signals at Rochester and Oswego section; 10.14 p. m., northwest storm signals at Duluth and Ashland section. 23d, 9.50 a. m., southeast changed to southwest storm signals at Rochester and Oswego section; 10.00 a. m., northwest storm signals at Lakes Huron, Michigan, and Superior (except Duluth and Ashland section); 1 p. m., changed to northwest storm signals on Lakes Erie and Ontario (except Toledo); 10.25 p. m., northwest storm at Newport section, Narragansett section, Woods Holl section, Boston and section, Portland, and Eastport.

XIV.—This appeared on the 24th, a. m., as a depression approaching British Columbia from the southwest. The barometric change on the coast of California and Oregon indicated that an extensive storm had been moving during the 22d and 23d northeastward over the Pacific. The central lowest pressure moved eastward during the 25th and 26th from British Columbia to Saskatchewan and then stretched southeastward, forming, during the 28th and 29th, a long crescent-shaped trough from Colorado to South Dakota and from Kansas to Lake Superior; this was followed on the 29th, p. m., by a well-marked center over Lake Superior, which disappeared on the 30th in Ontario.

In connection with this low area the following signals were ordered: Washington, 25th, 5.31 p. m., southeast storm signals on lakes Pepin, Superior, and Michigan. 26th, 9.00 a. m., southeast storm signals on Lake Huron; 9.40 a. m., southeast storm signals at Detroit, Toledo, Sandusky, Cleveland, Erie, and Buffalo. 28th, 10.20 a. m., information signals on lakes Superior, Michigan, and Pepin. 29th, 10.10 p. m., northwest storm signals on Lake Superior (except Sault Ste. Marie), lakes Michigan and Pepin; 10.10 p. m., southeast storm signals at Sault Ste. Marie and Lake Huron.

XV.—This, like its predecessor, apparently began as a storm area on the Pacific Ocean, moving eastward during the 28th toward Washington, in which Territory it was central on the 30th, a. m., and by the 30th, p. m., it had moved northward into British Columbia. The rest of its path belongs to the month of October.

NORTH ATLANTIC METEOROLOGY.

[*Pressure in inches and millimeters; wind-force by Beaufort scale.*]

NORMAL CONDITIONS.

The normal barometric pressure for September over the North Atlantic Ocean, as deduced from international simultaneous meteorological observations taken at Greenwich noon and not reduced to standard gravity, is highest, 30.18 (766), in a small region between latitudes N. 30° and N. 40° and longitudes W. 25° to W. 40°; it is lowest, 29.70 (754), over an extensive region covering Iceland, Greenland, Spitzbergen, and extending from N. 60°, W. 25° northeastward across the Arctic region to the coast of Siberia at N. 72°, E. 140°. Over the Pacific Ocean high pressure prevails from Oregon southwestward and low pressure from the Gulf of California southward. The lowest pressure in the Pacific is 29.70 in the eastern portion of Bering Sea, and this region is almost continuous with the low pressure in the Atlantic and Arctic oceans.

As compared with August, the normal pressures for September are 0.05 higher over the greater part of North America, and are 0.20 higher over central Asia and southeast Russia, but are lower over the Atlantic, Arctic, and Pacific oceans. The general path of storm centers in September is toward the west-northwest in that portion of the Atlantic and Pacific oceans which is between N. 10° and N. 30°, but toward the east-northeast or east-southeast for latitudes north of N. 35°,